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STUDIES OF RADIATION EFFECTS FOLLOWING NUCLEAR EXPLOSIONS

Forecasting Long-Term Effects

Sofia RENTGENOLOGIYA I RADIOLOGIYA in Bulgarian No 3, 1980 pp 186-190

[Article by Z. Paskalev, Iv. Nikolov and Em. Andreev of the MA (?Medical Academy), Scientific Institute for Roentgenology and Radiobiology, Prof Iv. Nikolov Director]

[Text] The radioactive products which are taken up into objects of the environment after the conducting of underground nuclear explosions are incorporated in the migrational processes of the biogeocenotic systems, as a consequence of which they can also be taken up in the human organism which is the extreme link of the ecological chain (1, 2, 3).

As is known, a characteristic feature of underground nuclear explosions is the formation of a significant amount of induced radioactive elements under the effect of the neutrons released in the explosion (6, 8).

The fractionation of the isotope composition over time into a mixture of artificial radionuclides formed after the underground nuclear explosion leads to the gradual enrichment by long-lived isotopes of strontium, cesium, barium and so forth. Precisely these radionuclides over a longer period of time after the underground nuclear explosions (from several days to several years) can be permanently included in the migration processes of the biogeocenotic systems and actually they determine the effect of the artificial isotopes on the individual links in the ecological chain (3, 4).

Up to now numerous works have been published on the quantitative content of the various types of artificial isotopes which are products from the fission of heavy nuclei and the secondarily induced isotopes in the objects of the environment (soil, air, plants and animals). There have been significantly fewer works on the migration and biological assimilability of artificial radionuclides in the links of the ecological systems over longer periods after the underground nuclear explosions.

A preliminary assessment of the effect of artificial radionuclides formed in underground nuclear explosions on the biogeocenotic systems (the quantitative content and the dose load) over a longer period of time can be made solely by forecasting methods.

The present work gives several methods for forecasting the quantitative content and dose load of individual links of the biogeocenotic systems over the longer run after the underground nuclear explosions.

The possibility of forecasting the effect of artificial radionuclides on the biogeocenotic systems is also of interest because of the use of underground nuclear explosions for peaceful purposes.

The secondary redistribution processes and the rate of migration by the radioactive isotopes are determined predominantly by their solubility, that is, by the ability of these radionuclides to pass from the particles in which they were included in the nuclear explosion into the aqueous solutions of the soils and plants.

It has been established that isotope solubility to a significant degree is determined by the physicochemical properties and the formation scheme (the chain of decay) with an underground nuclear explosion. The greatest solubility is found in isotopes which have gaseous or volatile isotopes as predecessors in the radioactive chain of decay. At the moment of the formation of solid particles, these isotopes are in a gaseous phase and are subsequently absorbed on the surface of the particles. The solubility of isotopes which do not have gaseous predecessors is extremely low.

In terms of the solubility factor for ^{90}Sr which is considered equal to 1.0, the solubility factors of the remaining isotopes formed in an underground nuclear explosion are ranked in the following sequence:

$$^{89}\text{Sr} > ^{90}\text{Sr} > ^{125}\text{Sb} > ^{140}\text{Ba} > ^{103}\text{Ru} > ^{106}\text{Ru} > ^{137}\text{Cs} > (^{134}\text{Cs}, ^{144}\text{Ce})$$

$$1.25 : 1.0 : 0.3 : 0.24 : 0.1 : 0.04 : 0.02 : 0.02$$

As the given research has shown, the solubility factor in an aqueous medium of the various isotopes formed in an underground nuclear explosion changes at different times after the explosion. For example, the transfer factor into an aqueous medium of the various isotopes formed in an underground nuclear explosion changes at different times after the explosion. For example, the transfer factor into an aqueous medium for isotopes contained in the gas and dust cloud on the first day after an underground nuclear explosion equals 3-12 percent of the total activity of the taken samples. Of the quantity of isotopes dissolved in an aqueous medium gradually increases over time and as one moves away from the epicenter of the underground explosion, with the solubility factor reaching 24 percent of the total activity for the particles falling on the earth's surface on the 10th day after the explosion.

Specifically, with underground nuclear explosions, a difference is observed in the solubility of isotopes contained in the dust particles of the base wave and in the gas and dust mushroom-shaped cloud. This difference is explained by the dissimilar ratio between the different types of particles which fall in the zone of the base wave and along the track of the radioactive cloud.

It has been established that for the different types of particles, the transfer of the radionuclides into an aqueous medium varies. For example, only 2-4 percent of the total activity passes into the aqueous solution from the particles where

the radioactive substances are distributed through the entire volume, while the transfer to an aqueous solution reaches 60-70 percent for the particles which are superficially contaminated by radioactive products. The degree of water solubility of ^{131}I , ^{132}Te , ^{103}Ru and ^{141}Ce contained in the dust component of the gas-dust cloud formed after an underground nuclear explosion is the same and reaches 60-70 percent, while solubility is 90 percent for ^{140}Ba .

For certain isotopes such as strontium and strontium, their solubility in an aqueous medium rises linearly as one moves away from the epicenter of an underground nuclear explosion.

As research has shown, the solubility of the strontium isotopes, ^{140}Ba and ^{103}Ru along the trace of the base wave is several-fold greater in comparison with the solubility of those isotopes taken from samples at a same distance along the axis of the trail of the gas and dust cloud.

The biological accessibility of the isotopes of strontium, cesium, cerium, yttrium and certain other radionuclides is an important characteristic of radioactive contamination along the trail of radioactive clouds formed after underground nuclear explosions.

By the biological accessibility of artificial radionuclides, one understands that portion of the isotopes which is capable of passing from the particles into a soil solution as a result of the processes of the washing out of the solid particles and dilution in an aqueous medium and thence be included in the migration processes along the soil--plants--animals--man chain.

The quantitative content of the artificial radionuclides in the plants depends upon the morphological features of the individual parts, and particularly their above-ground organs. As observations have shown, after a nuclear explosion the radioactive products are most retained by those plants which have very lush and fibrous above-ground parts (leaves and stems).

The pick-up factor f_p of a given isotope by plants is expressed by the ratio $f_p = q_p/q_s$, where q_p --the quantity of the isotope retained on the plant, q_s --the quantity of isotope which falls out on a level ground surface without plants.

The absorption and concentration of the isotope in the plants through the root system depend upon the type of soil, the landscape, the development stage of the plants, the climatic features of the terrain and so forth. In arid and steppe regions the penetration of artificial radionuclides into the plants during the first year after underground nuclear explosions occurs chiefly through the above-ground parts while the uptake of radioactive isotopes from the soil by the roots is insignificant. In areas with a temperate climate, the greatest amount of radionuclides is absorbed through the roots during the growing season.

It is essential to point out that at great distances away from the epicenter of an underground nuclear explosion (scores and hundreds of kilometers) the radioactive contamination of the terrain is caused chiefly by the isotopes of strontium, cesium and iodine and because of this they represent great danger for the health of the population over the longer run after the underground nuclear explosions.

Research has been conducted and the corresponding analyses made of data from observations to establish the correlation between the initial power of the exposure of gamma radiation P_0 at a height of 1 m above the earth's surface and the initial concentration of $q_0^{89}\text{Sr}$ and ^{131}I in the plants q_0 and for ^{89}Sr this dependence has the form:

$$q_0^{89\text{Sr}} = 3.2 \cdot P_0 + 12.4 \quad (\text{Bq/g}) \text{ with } t = 0,$$

and for ^{131}I , the ratio equals:

$$q_0^{\text{I}} = 0.015 \cdot P_0 + 0.004 \quad (\text{Bq/g}) \text{ with } t = 0,$$

where P_0 —the power of exposure ($2.58 \cdot 10^{-7}\text{J/kg}$) for the period of time (the hour of the explosion +24) at a height of 1 m above the earth's surface.

With the passage of time t after the nuclear explosion, the concentration of these radionuclides in the plants changes according to the law:

$$q(t) = q_0 \cdot e^{-\lambda_a t},$$

where λ_a represents the effective constant of the isotope half-loss from the plants and this is related to the effective period of half-loss: $\lambda_a = 0.693/T_{\text{ef}}$.

The effective period of isotope half-loss from the plants is determined from:

$$T_{\text{ef}} = \frac{T_1 \cdot T_k}{T_1 + T_k},$$

where T_k —the period of the elimination of isotopes from the plants under the effect of various environmental factors (meteorological conditions and so forth), T_1 —the period of the isotope half-life.

From plants the artificial radioactive isotopes can get into the organism of animals and depending upon their organotropism be concentrated in one or another organ. In this regard, most dangerous for the health of mammals and hence for man are the isotopes of strontium, cesium and iodine which accumulate in the largest amounts, respectively, in the bone tissue, the entire body and the thyroid gland of animals.

A correlation has been established between the concentration of strontium and iodine in plants and the quantitative content of these radionuclides in bones $q_{\text{bn}}^{\text{Sr}}$ and the thyroid gland q_{th}^{I} of animals and expressed by the following equations:

$$q_{\text{bn}}^{\text{Sr}} = \frac{q_0^{\text{Sr}} \cdot W_a \cdot f_c}{\lambda_c - \lambda_a} (e^{-\lambda_a t} - e^{-\lambda_c t})$$

$$q_{\text{th}}^{\text{I}} = \frac{q_0^{\text{I}} \cdot W_a \cdot f_b}{\lambda_b - \lambda_a} (e^{-\lambda_a t} - e^{-\lambda_b t}),$$

where W_a --the dry weight of the radioactively contaminated vegetation used by animals for food, f_c and f_b --the resorption coefficients by the gastrointestinal tract of ^{89}Sr and ^{131}I , λ_a , λ_b and λ_c --the effective half-loss constants of the isotopes from the plants (λ_a), the thyroid gland (λ_c) and the bones (λ_b).

It has been established that the average half-loss period for ^{89}Sr in the time interval from (D+5) to (D+30) days after an underground nuclear explosion equals 18 days. The number of ^{89}Sr in the bones of animals rises up to (D+30) day, after which over the time interval from (D+30) to (D+60) day, the quantity of ^{89}Sr in the bones is determined by its decay. The values of f_c and f_b are, correspondingly, equal to 0.06 and 0.26.

From the organism of animals the radionuclides can be taken up in milk and from here can be absorbed by the human organism.

A dependence has been established between the power of exposure P_0 at the initial moment after an underground nuclear explosion (hour + 24) at a height of 1 m above the earth's surface and the concentration of ^{89}Sr and ^{131}I in cow milk which generally can be described by the equation:

$$Q_{\text{milk}}(t) = \frac{P_0 \cdot \ell_m \cdot f_m}{\lambda_m - \lambda_a} (e^{-\lambda_a t} - e^{-\lambda_m t}),$$

where ℓ_m --dry weight of vegetable food consumed by animals related to a unit of volume of milk, f_m --coefficient for the taking up of the isotope in the milk expressed as the ratio of the individual isotope in the milk to the total quantity of the isotope in the animal's body, λ_m --the effective constant for the half-loss of the isotope in the milk.

From milk the artificial radionuclides can be taken into the critical organs of the human organism and their quantitative content can be determined by the formula:

$$Q_{\text{cr.op.}}(t) = P_0 \cdot \ell_m \cdot f_m \cdot \ell_h \cdot f_h \left[\frac{e^{-\lambda_a t}}{(\lambda_m - \lambda_a)(\lambda_h - \lambda_a)} + \frac{e^{-\lambda_m t}}{(\lambda_a - \lambda_m)(\lambda_h - \lambda_m)} + \frac{e^{-\lambda_n t}}{(\lambda_a - \lambda_n)(\lambda_m - \lambda_h)} \right],$$

where ℓ_h --the volume of the consumed milk related to a unit of weight of the organ (or tissue) of man, f_h --the coefficient for the depositing of the isotope in the critical organ, λ_h --the effective constant for the half-loss of the isotope from the critical organ.

The absorbed dose which is formed in the critical organ over the period of time $t = 0$ to $t > 0$ can be calculated using the formula:

$$D(t) = q_0 \cdot \ell_m \cdot f_m \cdot \ell_h \cdot f_h \cdot K_r \left[\frac{1 - e^{-\lambda_a t}}{\lambda_a (\lambda_m - \lambda_a) (\lambda_h - \lambda_a)} + \frac{1 - e^{-\lambda_m t}}{\lambda_m (\lambda_a - \lambda_m) (\lambda_h - \lambda_m)} + \frac{1 - e^{-\lambda_h t}}{(\lambda_a - \lambda_h) (\lambda_m - \lambda_h)} \right],$$

where K_r considers the effective energy of ionizing radiation, the coefficient of the quality of radiation therapy and the absorbed dose of a unit of activity.

In addition to milk, artificial nuclides can be absorbed by the human organism by inhalation, by water and by food (diet).

The quantity of the absorbed isotopes in this instance depends upon the degree to which the objects of the environment are contaminated by these isotopes and is determined by the rate of their migration through the biological chain of the ecological system. Generally speaking the rate of migration is determined by a multiplicity of parameters characterizing the typomorphic features of the soil, the density of the plant cover, the method of working the soil, agricultural activities and so forth.

In the most general instance, the quantity of isotope i , A_i in the given organ (but not the gastrointestinal tract) can be determined according to the formula:

$$A_i = \frac{\sigma_i \cdot c_i \cdot b_i \cdot a_i}{\lambda_{a_i} - \lambda_i} (e^{-\lambda_i t} - e^{-\lambda_{a_i} t}),$$

where σ_i --the surface density of contamination of the terrain (or the used products) by the given isotope, c_i --coefficient characterizing the biological assimilability of the isotope, b_i --coefficient considering what portion of the radionuclide reached the critical organ over a unit of time in comparison with the quantitative content of the radionuclide on the earth's surface, a_i --the portion of the isotope which was taken up in the given organ in comparison with the total quantity of the isotope absorbed by the human organism.

The absorbed dose in the given organ formed over the interval of time (t_1 , t_2) is in this instance determined by the formula

$$D_i(t_1, t_2) = \frac{k \cdot \epsilon_i \cdot \sigma_i \cdot c_i \cdot b_i \cdot a_i}{m(\lambda_{a_i} - \lambda_i)} \left[\frac{-e^{-\lambda_i t_1} e^{-\lambda_{a_i} t_2}}{\lambda_i} - \frac{-e^{\lambda_{a_i} t_1} e^{-\lambda_{a_i} t_2}}{\lambda_{a_i}} \right],$$

where k --constant determining the units of measure, ϵ_i --effective energy of ionizing radiation of isotope i , m --weight of critical organ.

For the gastrointestinal tract where the isotope is not accumulated, the absorbed dose in the most general instance is determined for the individual parts of the tract using the formula:

$$D_i(t_1, t_2) = \frac{k \cdot \epsilon_i \cdot \sigma_i \cdot b_i \cdot c_i \cdot t_3 \cdot e^{-\lambda_i t_4}}{2m\lambda_i} (e^{-\lambda_i t_1} - e^{-\lambda_i t_2}),$$

where t_3 --the duration that the isotope remains in the given section of the gastrointestinal tract (the stomach, the small intestines, the upper or lower section of the large intestine), t_4 --the interval of time between the ingesting of the isotope and its reaching of the corresponding section of the gastrointestinal tract (for the stomach $t = 0$, for the small intestines it is considered $t = 1$ hour and so forth).

In this manner, using the designated formulas it is possible to forecast the quantitative content of the various types of isotopes (predominantly strontium, cesium and iodine) in the objects of the environment and their uptake by the human organism.

According to the data of the calculations made, the various types of artificial isotopes formed in an underground nuclear explosion and released into the environment form a varying dose in the individual links of the biogeocenotic system (plants--animals--man) with the isotopes of $^{137}\text{cesium}$ (for the entire body), $^{89}\text{strontium}$ and $^{90}\text{strontium}$ (for the bones) and $^{131}\text{iodine}$ (for the thyroid) making the greatest contribution to the dose of internal radiation.

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Features of Acute Irradiation

Sofia RENTGENOLOGIYA I RADIOLOGIYA in Bulgarian No 3, 1980 pp 192-194

[Article by G. Vasilev, M. G. Mikhaylov and E. Andreev of the MA, Scientific Institute for Roentgenology and Radiobiology, Director, Prof Iv. Nikolov; article received April 1980]

[Text] Under conditions after a nuclear explosion, the human organism is exposed to a combined radiation effect (1, 2, 3).

I. The basic sources of radiation are the following:

1. The external radiation from gamma radiation of radioactive substances located in the radioactive cloud-- γ -cloud (γ_c).
2. External radiation from gamma radiation of radioactive substances located on the earth's surface (deposited and activated by the neutron flux)-- γ -surface (γ_s).
3. External contact radiation from beta radiation with the contaminating of the skin by radioactive substances-- β -skin (β_s).
4. Internal radiation from beta radiation of incorporated radioactive substances (inhaled, through the mouth, percutaneously and by wounds)-- β -internal (β_i).
5. Other sources and other radiation which make an insignificant contribution to the total irradiation such as the beta external radiation from the radioactive cloud and contaminated surfaces; the gamma external from contamination of the skin; gamma and alpha internal from incorporated radionuclides (α , β and γ).

II. The duration of irradiation from the viewpoint of the particular features of the radiation action can be divided as follows:

1. Brief acute radiation--up to 1-2 hours.
2. Acute radiation--up to 4 days.
3. Extended radiation--more than 4 days.

III. According to the ranges of doses which cause consequences, acute irradiations can be grouped as follows:

1. Doses of total irradiation up to 150-200 rad. The probability of a radiation-caused death is under 5 percent. Mild forms of radiation sickness.
2. Doses between 200 and 800 rad. The probability of death is between 5 and 90 percent. Severe forms of radiation sickness.
3. Doses over 800-900 rad. Probability of death is over 90-95 percent.

IV. In terms of the frequency of expected somatic effects in the lethal dose range (doses under 900 rad), the organs of the body can be grouped as follows:

1. Red marrow (RM) and gastrointestinal tract (GIT).
2. Skin.
3. All other organs.

Between the four groups of factors--the sources of radiation, the duration of irradiation, the radiation doses and the groups of critical organs--there are definite dependences an analysis of which is essential in planning the corresponding counter-radiation measures.

Table 1 gives the relative participation of the various sources of radiation in the doses for groups of critical organs over various periods of time.

Table 2 shows the ratio of the obtained doses of various groups of organs over various periods of time.

Table 1

Organ \ Source	γ_c	γ_g	θ_g	θ_l	α, θ, γ	T
RM	0.8	0.2	--	--	--	T < 2 hr.
GIT	0.8	0.2	--	--	--	
Skin	0.8	0.2	--	--	--	
Other organs	0.8	0.2	--	--	--	
RM	0.1	0.9	--	--	--	2 hr. < T < 4 hr.
GIT	--	0.1	0.9	--	--	
Skin	0.1	0.9	--	--	--	
Other organs	--	--	--	--	--	
RM	--	0.2	--	0.6	0.2	T > 4 days
GIT	--	0.2	--	0.8	--	
Skin	--	--	1.0	--	--	
Other organs	--	0.2	--	0.7	0.1	

Table 2

Organ \ Periods	RM	GIT	Skin	Other Organs
T < 2 hr.	1	1	1	1
2 hr. < T < 4 days	1	1	50	1
T > 4 days	5	2	1	1

Among the various factors one can also note other dependences, for example, for the type of irradiation (internal and external), the type of radiation (photon and corpuscularly), various OBE [expansion unknown] and so forth.

From the two tables a number of conclusions can be drawn having direct bearing on radiation safety. Some of them which are of a nontrivial nature are as follows:

1. All organs beside the skin sustain in early periods ($T < 4$ days) photon radiation and the readings of personal dosimeters are reliable for the dosimetric estimates.
2. In the later periods ($T > 4$ days) the basic portion of the doses is from internal radiation and the monitoring of the contamination of foods and water is essential.
3. The food can receive doses which are one- or two-fold greater than the doses of the other organs and particular attention must be paid to cleaning radioactive contamination off the skin.

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Forecasting Lethal Outcome From Uneven Irradiation of Human Being

Sofia RENTGENOLOGIYA I RADIOLOGIYA in Bulgarian No 3, 1980 pp 194-197

[Article by Kr. Ingilizova, G. Vasiliev and M. G. Mikhaylov, MA, Scientific Institute for Roentgenology and Radiobiology, Director, Prof Iv. Nikolov; article received March 1980]

[Text] In analyzing the nature of the dose distribution in the human body radiated by ionizing radiation from a nuclear explosion, we must state that the irradiation is emphatically uneven. The unevenness factors (that is, the ratio between the largest and smallest dose) reach up to 10 depending upon the direction of irradiating the body and the type of radiation (1).

In the present paper, we will review two cases of irradiation: with a nuclear explosion of a "classic nuclear weapon" (fission--fusion--fission) with mixed ionizing radiation (gamma and neutron), and irradiation with the detonating of a "neutron bomb" where the radiation is substantially enriched with fission neutrons.

Proceeding from our own experimental data on the distribution of radiation doses in the red marrow (RM), we offer a model for predicting a lethal outcome (that is, the probability of death) with uneven radiation (2).

The basic forecast equations in the model are:

$$I = A \cdot B \left[1 - \left(\frac{1}{IK_n} \right) C \right] \dots (1) \quad \text{and} \quad I = \frac{D_{un}}{D_{ev}} \dots (2),$$

where:

I is the index of the change in biological effectiveness which shows how much greater is the radioeffective dose with uneven radiating (D_{un}) and that with even irradiating (D_{ev}).

IK_n is the integral coefficient for the irradiating of the RM and this is the ratio of the maximum and minimal integral doses by which the individual parts of the red marrow are irradiated:

$$IK_n = \frac{(D' \cdot m')_{\max}}{(D'' \cdot m'')_{\min}} \dots (3)$$

A , B and C are constants characteristic for the given biological species (mammals). The basic equation was obtained experimentally in irradiating rats. In using the principle of equivalence of the basic radiation syndromes for mammals and the data of various authors (3, 4, 5), we have found the values of the constants which are applicable for practically evaluating the radiation-induced lethal consequences in man. These values are:

$$A = 0.67, B = 9.7 \text{ and } C = 0.33.$$

Our forecast for the probability of a lethal outcome with irradiating under the conditions of a nuclear explosion is based on the determination of the irradiating of the red marrow and the applying of the system of equations of 1, 2 and 3.

Table 1 examines the case of the ventrodorsal exposure to radiation for a standing man facing the epicenter, while Table 2 gives the figures for the craniocaudal exposure for a lying person with his head toward the epicenter (in order not to complicate the work we have not given other possible geometries of irradiation). Column 1 shows the distribution of the red marrow (percent) in the individual areas (the body has been divided into five areas in Table 1 and into eight in Table 2). Column 2 gives the relative distribution of the doses (D) in the individual areas of the red marrow, in using 1.0 as the highest dose. Column 3 shows the relative values of the integral doses ($D \cdot m$). Column 4 gives only the maximum and minimum values of the integral doses. Column 5 calculates the IK_n (depending upon 3) and column 6, the index for the change of biological effectiveness (depending upon 1).

As is most often accepted (6, 7), the lethal doses for a man with even radiation are LD (5%) = 225 ber, LD (50%) = 450 ber and LD (95%) = 900 ber. In using the calculated values of I , we can obtain the assumed values of lethal doses in the instances of uneven irradiating. These are shown in Table 3.

Table 1

Irradiation of a Standing Person Facing the Epicenter (ventrodorsally)

$\gamma + n$					
RM (Z)	D	D·m	Max. and Min.	IK _n	I
1	2	3	4	5	6
19	1.0	19.0	19.0	2.8	1.3
17	0.7	12.0			
17	0.6	10.2			
17	0.4	6.8	6.8		
30	0.4	12.0			
		n			
19	1.0	19.0	19.0	5.6	1.8
17	0.5	8.5			
17	0.4	6.8			
17	0.2	3.4	3.4		
30	0.3	9.9			

Table 2

Irradiating of Lying Person with Head Toward Epicenter (craniocaudally)

$\gamma + n$					
RM (Z)	D	D·m	Max. and Min.	IK _n	I
1	2	3	4	5	6
13	1.0	13.0	13.0	13.0	2.5
14	0.7	9.8			
14	0.6	8.4			
10	0.4	4.0			
14	0.3	4.2			
26	0.2	5.2		1.0	
5	0.2	1.0	1.0		
4	0.3	1.2			
13	1.0	13.0	13.0	16.2	2.7
14	0.4	5.6			
14	0.3	4.2			
10	0.2	2.0			
14	0.1	1.4			
26	0.2	5.2		0.8	
5	0.2	1.0			
4	0.2	0.8	0.8		

Table 3

Values of Lethal Doses with Uneven Irradiation

Probability of Death →	5%	50%	95%	Type of Irradiation
LD (ber)	225	450	900	even
	300	600	1200	$\gamma+n$ ventrodorsally
	400	800	1600	n
	550	1100	2200	$\gamma+n$ craniocaudally
	600	1200	2400	n

We can see that the lethal doses with irradiating realized under the actual conditions of a nuclear explosion are significantly higher than those which are characteristic with uneven irradiating. If we apply the dose--effect dependence $L = f(D)$ which in the range from $L = 5\%$ to $L = 95\%$ is almost rectilinear, it must be concluded that with equal doses, the probability of death with uneven irradiating is slighter than the case of even irradiating. The model proposed by us makes it possible to propose quantitative forecasts for L , proceeding from the specific irradiating conditions.

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10272

CSO: 2202/13

HIGHLY FUNCTIONAL ELECTRONIC SYSTEMS DISCUSSED

Sofia BULGARIAN FOREIGN TRADE in English No 2, 1981 pp 14-15

[Article by A. Stamenov, vice minister of electronics and electrical engineering]

[Text]

The modern material-cum-technical base of Bulgarian electronics makes it possible to tackle problems in the main directions of computer technique and business machines, means of automation and instrument-making, electronic systems, semiconductor technique and appliances. In 1976-80 the annual growth rate of these products exceeded 15%.

Thanks to cooperation with the USSR in the field of computer technique, we are now producing computer EIM ES 1035, which programmatically is compatible with the other models of the Unified System (ES) and is designed for solving a wide range of scientific, technical and economic problems, per se or as part of systems functioning in real time, dialogue regime and time-division.

The ESTEL-system configuration of the ES 1035 computer offers great facilities for data-teleprocessing. On its part, this system, organized with an ES 8371 communication processor and a large set of terminals, permits to establish an information system for the control of objects which in practice lie far apart (at unlimited distances). The ES 1035 finds employment in the solution of problems connected with the processing on large matrices in geology, seismology, meteorology, linear programming, special mathematical analysis and in other spheres of knowledge.



A. Stamenov

The new 100-200 MB (megabit) disk subsystem functions within the ES 1035 system. An original Bulgarian product, it has a much greater memory volume than the subsystems existing so far.

The results obtained in the field of problem-oriented complexes also refer to the computer-technique theme. The all-purpose SM 4 minicomputer system is designed on the basis of a new generation of technical and programmatic means of the SM computer family. The module principle underly-

ing the design permits to build up a great variety of problem-oriented complexes. One of these is the Infomag complex, a powerful informational as well as multi-consumer system for data base, which operates in a time-division and a multi-programme regime with basic functions: data collection storage, analysis and search in conditions of collective accessibility.

One of the greatest achievements of Bulgarian computer technique is the SALT multiprocessor minicomputer system for the automation of engineering work. It is of particular interest to engineers, designers and instructors, working in the fields of electronics, machinebuilding, architecture and construction work, as well as light industry. Printed plates of integrated circuits are designed through SALT in a dialogue regime in the electronic industry. This system is a typical representative of interactive systems in which man takes part in the calculations with his experience and intellect. The dialogue between the system and the operator is realized on the screen in a graphic display by means of a luminous pencil and an operator's desk in real time.

Interesting results have been obtained in tackling problems connected with the automation of various processes in the sphere of agriculture and agricultural machinebuilding. These boil down to the introduction of a data-processing system designed for the operative control and automation of financial-bookkeeping and accounting work in agroindustrial complexes, as well as of a system for dispatcher connection whereby the effectiveness of control is greatly increased by connecting subscribers to different pieces of equipment with the subscribers to automatic branch exchanges, type ATSK — 50/200.

The intensifying electronization trend in agriculture finds an expression in the introduction into production of a range of systems for the automatic control and management of agricul-

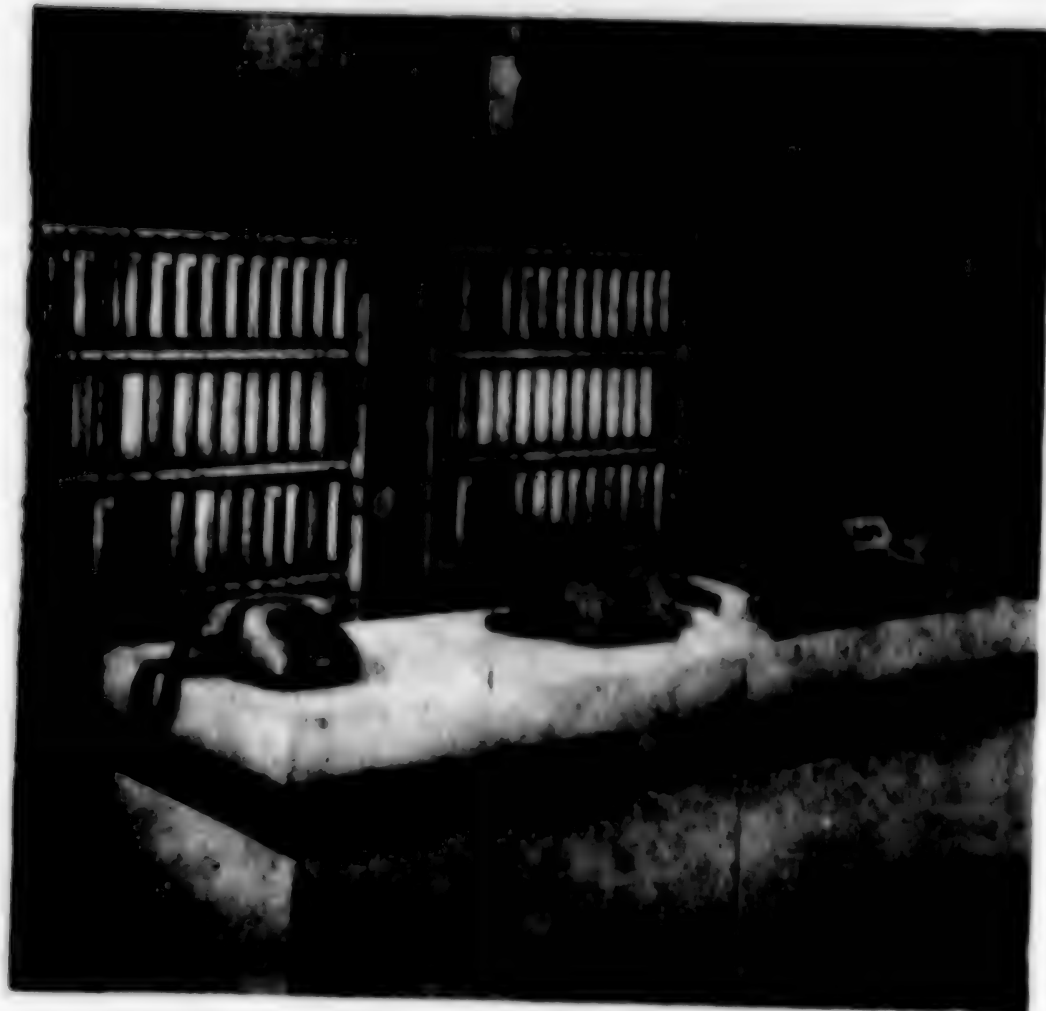
tural machines and equipment. Among these, let us mention USAK, a system for the automatic control of working organs of self-propelled machines; SAV, a system for the automatic guidance of self-propelled combine harvesters; KEDR, SAKS and USKS, systems for the control of sowing, and SEAC-1, a system for the automatic sugar beet sowing.

The continuous modernization of the technological equipment and the technological methods are resolved by elaborating and introducing various electronic and electromechanical non-standard machines, devices and systems. Microprocessors and microcomputer testers for measuring printing plaques, transistors and magnetic heads are a typical expression of what has been accomplished in this sphere. Other developments include: a coil machine for transformers, thyristor converters, a device for checking the mounting of TTL integrated circuits, an instrument for measuring electrolytic condensers, and an automated system for the diagnosis and control of printing plaques. Pneumatic equipment for the processing of materials — atomizing plastic details, pressing rubber details, etc. — has also been introduced.

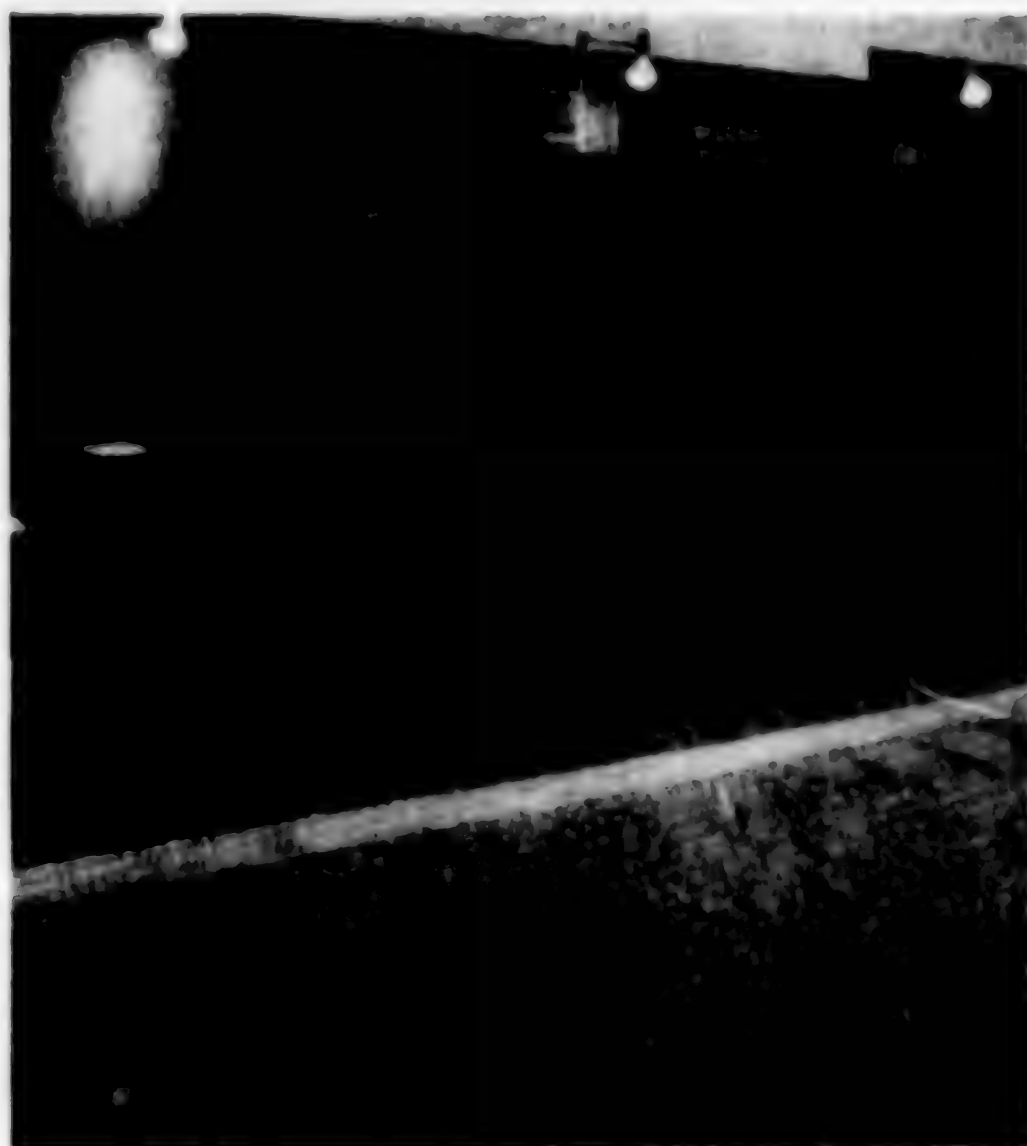
The element base is being steadily improved and updated in accordance with the latest trends. It comprises MOS integrated and microprocessor circuits, quartz and selenium products, resistors, condensers, diodes, transistors, optrones, communication technique elements, magnetic heads and printing plaques, and metalloceramic products. These are a prerequisite for the modernization of the finished products. The use of a modern element base in the communication industry made it possible to devise the M-400 office automatic telephone exchange with microprocessor control. This is a qualitatively new development of the Crosspoint exchange based on a Siemens licence, previously produced in Bulgaria. M-400 may be considered a

major achievement of Bulgarian engineering. Its advantages are due to its microprocessor control; it uses up only half the amount of metal as its predecessor, yet is much more efficient.

Bulgarian electronic products are characterized by wide functional possibilities and convenience in operation. They fully meet the steadily growing requirements of the domestic and foreign market. The high technical and economic parameters and the modern design made it possible in the past decade or so to export these products to a steadily growing number of countries. The increased production potential of Bulgarian electronics should reinforce this favourable export trend.



ESK-M-400 automatic telephone exchange with microprocessor control



Infomag complex, a powerful information multiconsumer system

CSO: 2020/56

DEMAND FOR BULGARIAN DRUGS GROWING

Sofia BULGARIAN FOREIGN TRADE in English No 2, 1981 p 40

[Article by M. Sahakian]

[Text] The Pharmachim Foreign Trade Organization exports a wide range of drug forms and substances in a finished state: antibiotics in a broad spectrum, microbial preparations, antipyretics and analgetics, synthetic and phytochemical products, organopreparations, as well as dressings.

The Bulgarian pharmaceutical industry is continuously renewing its production list. Research work aimed at producing original Bulgarian preparations, corresponding to modern medical requirements, has been making considerable progress. Particularly effective and promising as regards demand on the international market are the preparations against cardiovascular diseases, tranquillizers, antibiotics and sanitary preparations for the oral cavity. A number of Bulgarian drugs for prophylaxis and for combating ailments have become widely known abroad. Among these, let us mention in particular: Nivalin for the treatment of polyomyelitis, Glauvent coughdrops, Crataemon which stimulates the heart activity, Tabex to combat smoking, Gastropharm for the treatment of gastro-intestinal diseases, and a dry substance for pediatric syrups-antibiotics. Certain Bulgarian cosmetics have likewise curative properties: the Rosalia anti-allergic cream, the Lada anti-acne cream, the Achromin depigmentation cream, and the Nora antimycotic foot cream. In surgical practice the Kanokonlit glue enjoys a good reputation.

Bulgarian drugs have won a good name in some 80 countries. They are exported in considerable quantities even to such medically advanced nations as FRG, Switzerland, Holland and Italy. Bulgarian antibiotics, antipyretics, analgetics, tuberculostatics, vitamins, psychotropic and animalarial preparations are being increasingly marketed in Iran and Iraq, Indonesia and Singapore, Algeria and Libya, Syria and Lebanon, Senegal, Nigeria and Ethiopia, Tanzania and Angola, India and Pakistan, Thailand and Paraguay. UNICEF is meeting a large part of its requirements for pediatrics in the developing countries with Bulgarian drugs.

Pharmachim will apply certain new forms of work, depending on the concrete needs of the different markets. There would seem to be good prospects of producing antipyretics containing Bulgarian semifinished products and of producing original Bulgarian drugs in India, of producing antibiotics containing Bulgarian semifinished products and phytochemicals from local raw materials in Brazil, of producing

organic preparations in Argentina and vegetable extracts in Angola, as well as of producing drugs containing Bulgarian substances and active components in Nigeria, Ethiopia, Bangladesh and Afghanistan.

Future exports will be attuned to trends revealing a preference for semifinished products and substances. The marketing of original and classical medicinal forms will also expand. In the next few years Pharmachim's export list will continue to feature antibiotics for human and veterinary medicine, vitamins as well as sera.

CSO: 2020/56

USKS--A NEW ELECTRONIC SYSTEM FOR AGRICULTURE DESCRIBED

Sofia BULGARIAN FOREIGN TRADE in English No 2, 1981 p 35

[Article by Eng V. Vlaeva]

[Text] The ZENA plant in Tolbouhin, which specializes in the production of agricultural apparatus, has begun to turn out the USKS system for control of the functioning of drills for fused sowing. What does it perform?

This system secures good control of cereals when operating with drills SZ-3.6, SZU-3.6 and SZA-3.6, as well as of other grain drills with tubes of these types. At the same time it keeps tab on the sowing, the rotation of the sowing shaft and the seed level in the hoppers. When some of the controlled organs do not function properly, the tractor driver obtains sound and light information about the place and the nature of the damage. USKS can simultaneously service from one to eight drills, each of which can sow up to 24 rows, thus improving the sowing process and rendering the functioning of the drills more reliable. A major advantage of this apparatus is that it eliminates the necessity of the drill being serviced by an operator, whose work is laborious and dangerous to health.

Wherein does USKS consist? It is an all-purpose, fully automated electronic system, based on the module prin-

ciple. It consists of two basic blocks. The control block, which is mounted in the cabin of the tractor-driver, shows in which drill the damage has occurred and what its nature is. From the indicatory device mounted on every drill the tractor-driver learns the number of the irregularly sowing tubes. Transducers about the sowing, the grain level and the rotation of the sowing shaft are attached to this indicatory device.

Particular attention is paid to the system's supply. It functions normally with voltage variations of 10 to 20 V. What are the results of the test?

The first models were tested in 1979 at the machine-testing station in Rousse during wheat sowing. The results showed a definite improvement of the quality of the sowing.

In the spring of 1980 the system was tried out in the districts of Razgrad and Tolbouhin when sowing alfalfa and hemp. The comments of the farmers were very good indeed.

An additional important finding was that it is readily and conveniently mounted on the sowing aggregates, during operation and service. No structural modifications of drills and tractor are necessary.

BRIEFS

Q-FEVER PREPARATIONS DEVELOPED--The Institute of Virology of the Slovak Academy of Sciences has developed diagnostic preparations and vaccines against infection of humans and animals by Q-fever. These preparations, which have been widely tested and prevent infection of cattle and sheep, have also substantially reduced the possibility of infection of livestock-breeding personnel. [Prague ZEMEDLSKE NOVINY in Czech 8 Jul 81 p 4]

CSO: 2402/72

APPLICATION, DEVELOPMENT OF COMPUTER TECHNOLOGY IN SIXTH FIVE-YEAR PLAN

Budapest SZAMITASTECHNIKA in Hungarian No 5, May 81 pp 1-2

[Article: "The Development of Computer Technology Applications in the Sixth Five-Year Plan"]

[Text] The economic policy content of the Sixth Five-Year Plan, the planned rate of economic development for the period 1981-1985 and the chief ratios thereof all serve as basic guides for the development of computer technology applications. The Council of Ministers discussed and adopted the report of the SZKFP [Central Development Program for Computer Technology] concerning tasks for the years 1981-1985 in April 1981 and set further tasks to concretize the tasks of the Sixth Five-Year Plan of the people's economy—defined a more efficient application of computer technology as a chief goal.

The Initial Situation

A balance of the fulfillment of the Fifth Five-Year Plan, now completed, can be prepared already. In sum it can be established that in the course of the past 5 years the application of computer technology developed in the direction set in the plan. The goals set for the period 1976-1980 were basically fulfilled. The incorporation of computer technology into economic and social processes continued. The computer has become a necessary tool for the basic activity of organizations making use of computer technology services. But the rate of development was more moderate than planned and fulfillment deviates from what was planned in the area of certain partial tasks.

In the course of years past about 2,500 enterprises have joined the ranks of organizations making use of computer technology at some level. Almost half (48.5 percent) of the computers available at the end of 1980 (a total of 743, according to preliminary data, not counting mini and microcomputers) were operating at enterprises. The gross value of equipment at the end of 1980, including minicomputers and data preparation equipment, exceeded 18 billion forints. The growth rate for the value of equipment can be expected to decrease between 1981 and 1985.

The original goals of the SZKFP for the Fifth Five-Year Plan period were correct. The results achieved in the course of the past 5 years are also the foundations for our present development. Experiences in execution also indicate certain

negative phenomena. For example, our IaP (remote data processing) and network ideas did not prove realistic.

In the course of carrying out the Fifth Five-Year Plan national economic conditions became substantially less favorable for computer technology. At the same time, guidance did not sufficiently encourage or force users or those engaged in applications to accommodate to circumstances flexibly. We were not prepared to accept measures of a braking or slowing character and we did not have adequate means to carry them out. In several respects the past period was characterized by a search for paths.

The application of computer technology has entered an intensive phase of development. It is possible to progress further only by means of quality factors, with better work. Some of our conditions are encouraging--the information which has accumulated, the number of highly trained experts, the international experiences and the favorable conditions for exploiting capacity make it possible for us to meet present requirements better.

Characteristics of the SZKPP

The chief direction of the SZKPP tasks for the Sixth Five-Year Plan is an increase in the efficiency of applications. Our goal is a consolidation of the results achieved, a further improvement of the level and a strengthening of quality elements. The computer technology program for the years 1981-1985 is open; the guides in it are primarily to show the direction and are of an orienting nature. The investment decisions contain obligations only for the first 2 years of the plan period. Considering the unforeseeable circumstances and changes there is need for a flexible program in regard to practical action; and there is need for well considered reaction.

The central developmental program cannot in itself solve the tasks of applications; it must be supplemented by local initiatives and executive measures. Economical and competitive applications must appear in modern, sought after, good quality products and services. Thrift is a general requirement--to be able to perform the same tasks at less cost and with smaller specific expenditure. In essence this also means that a better utilization of our existing equipment will in itself ensure development and make possible the solution of more tasks. We might also say that the 1981-1985 program contains low quantitative prescriptions and high efficiency prescriptions. All this is necessary because it is a concomitant of the intensive phase.

It is in our interest that there be a swift development of organizations which work economically and more efficiently and conduct activities which satisfy demand profitably. So priority will be given in applications plans to developments which will aid directly and in the short run.

--the creation of comprehensive guidance and information systems or an increase in their capacity;

--the creation of computerized production guidance and management information systems for those of our enterprises which have favorable conditions for economical and efficient production;

- the spread of computerized guidance of production and service processes;
- the realization of computerized systems which significantly improve the organization and automation of work processes demanding of material and energy in connection with new investments and large reconstructions;
- the development of a network of computer centers providing computer services to enterprises not having their own computers; and
- increasing the efficiency of engineering design and scientific work by the application of computer technology.

Application Conditions

The investment limitations arising in connection with computer technology developments make necessary intensive development and demand increased coordination of management and guidance systems at various levels. Computer technology investments, including the expansion of existing systems and the replacement of equipment, must be carried out in such a way that total capacity increases substantially more quickly than the number of units--considering the greater capacity of new computers, the higher technical level and a more favorable supply of programs.

The spread of mini and microcomputers will accelerate further. This category can ensure operational computer support of the several economic activities for a broad sphere of users with relatively lower investment sums and with their aid it will be possible to have access to the larger computers and to create networks later.

The technical base for new computer technology capacity in the period 1981-1985 will be made up basically of domestic products and of socialist import devices belonging to the ESZR [Uniform Computer Technology System] and the MSZR [Minicomputer Technology System]. It will be possible to satisfy a larger part of the need for small and minicomputers and data collection and recording systems from domestic manufacture, a smaller proportion being satisfied from socialist import.

The devices available in the plan period are already suitable for the development of remote processing systems. The Post Office will provide the communication lines needed for data transmission; a postal data network expressly serving computer data transmission will begin operation in 1981 but use of the traditional telephone network will continue to be characteristic.

In the interest of ensuring a supply of uniform, good quality basic software for domestic and socialist import computers:

- we must define the standard basic software which can be used with the several computer types;
- we must see to the introduction, teaching and maintenance of these; and
- we must ensure the debugging of them and ensure that we constantly make available the newer versions (the so-called follow-up service).

One of the basic conditions for realization of applications development goals and tasks is the existence and rational operation of a network of high level unique computer technology infrastructural institutions coordinated regionally and in their operations.

In the past period the Computer Technology Applications Development Fund (SZAFU) well served the improvement in the supply of programs for import BESM computers, primarily by acquiring and adapting procedures and program products proven abroad which could be used in a broad sphere. We must continue to ensure that the acquisition and sale of program packages needed by a number of users take place with central coordination on the basis of a mutual interest system.

Correct price work is an important tool for achieving our applications development goals. Our goal is to create a greater use-value and ensure more efficient production and service by means of a differentiation of incomes. It would be desirable to reduce the general price level of services in such a way that the general profitability of the branch should not decline.

If the training ratios are modified the present training system, with respect to both study course and institutional instruction, meets the requirements. In the course of the modification we must provide experts having comprehensive information and capable of creating large computer technology systems and we must improve the harmony between the teaching of computer technology and organizational information.

Enterprise Applications

In the Sixth Five-Year Plan enterprise applications must serve basically to increase direct economic efficiency and must aid an increase in the quality level of products and services. A significant development of computer technology applications is being undertaken by 33 enterprises. In their case beginning to build up integrated computer systems is a realistic goal--the operational implementation of certain guidance-management subsystems, sometimes building up a complete system, as a function of automation and process control tasks, and based also on the new achievements of microcomputer technology. The developments will be supported in a coordinated way from the professional and methodological side by the guidance organs for computer technology and by the computer technology applications committees of the ministries by ensuring the cooperation of service organizations, in passing judgement on the acquisition of basic computer technology tools and the credit needs connected with development and, in justified cases, by issuing import permits. Needs for program products will enjoy priority in the development of the national program library.

About 25 institutions working as enterprises provide computer technology services as their chief profile or in significant volume--planning and organizing computer technology applications systems, programming or machine processing. By the end of the Fifth Five-Year Plan these organizations had at their disposal almost 30 percent of the domestic computer technology capacity and a significant part of the expert personnel.

During the Sixth Five-Year Plan the significance of the service organizations will increase further both in satisfying enterprise needs and in connection with processing done for ministries and chief authorities.

About 800-1,000 new users introducing computer technology at the initial level will appear in the plan period. In addition to the above about 100 enterprises now have their own computer technology equipment. For the most part their applications embrace business and record keeping areas but they are increasingly being introduced into other processes, improving the organizational level of the work of the entire organization. About 500 organizations regularly have processing done by computer technology base institutions and services. Of these, 60-80 organizations will attain, during the Sixth Five-Year Plan, a level which will justify the creation of their own equipment base. In addition, about 1,600 management units use computer technology with varying frequency to carry out business and record keeping tasks. Some of these enterprises are beginning to control certain technological processes with mini and microcomputers.

State Administrative Applications Tasks

Party and government resolutions passed concerning the modernization of state administration prescribe a further development of the cooperation of state administrative organs. The most important applications tasks are:

- development of cooperation among central state administrative data processing systems;
- creating computer technology applications bases for regional administration;
- a rational development and integration of basic national records; and
- the formation and development of information systems for administrative and guidance purposes for the economic ministries and organs with national authority.

In the course of a coordinated execution of the developmental tasks it would be useful to treat in a uniform way tasks affecting several state administrative organs. In the interest of carrying out the developmental tasks we must see to the replacement of tools used in the computer parks of the Central Statistics Office, the National Planning Office, the Ministry of Labor and the Ministry of Finance, while concentrating the developmental capacity available.

A State Administrative Informatics Association has been formed with the participation of the information service institutions of these guiding organs; this association takes care of development in the manner detailed in the association contract. In accordance with a resolution of the Council of Ministers a coordinated development of the regional data processing subsystems of the Ministry of Finance and of the Central Statistics Office has begun as well. The chief authorities affected have worked out and approved a common program for regional development. A developmental program for the development of a model computerized system for regional administration is being worked out in the interest of offering a modular organizational, business technology and computer technology solution to various levels of regional administration. The system will fit in to the regional subsystems of the large state administrative systems to the necessary degree. The national regional jobwork network, the regional systems of state administration and the computers of the councils themselves may serve as a base for the computerized systems of regional administration.

During the Sixth Five-Year Plan it will be justified to develop only those so-called "multi-function" national basic records which were already "in operation" in the Fifth Five-Year Plan or which were ordered by state resolutions.

Research and Development

Within the framework of the National Medium Range Research and Development Plan (OKKFT) they developed and approved for the Sixth Five-Year Plan period a research and development program titled "Research and Development of Computer Technology Applications Systems." This prescribes primarily the development of model systems which will ensure the achievement of concrete economic results in the area of material production (for example, model systems for production guidance in large enterprises, integrated electronic planning, manufacturing and control systems, sample systems for agriculture and the food industry and import and domestic ESZR and MSZR model systems). It includes research and development work aimed at creating model systems for council administration, program development methods making possible modern technological applications and the research necessary for the spread of standard software.

The research and development trends stressed in the sixth five-year plan of the SZKCP (as published, SZKFP was probably intended) are:

- integrated production control systems;
- development of uniform methodological principles and aids for computer technology applications and a further development of the technology of software preparation;
- development of systems, tools and methods necessary for the graphic and conversational processing which serves to improve the man-machine link;
- development of computer networks; and
- development of special purpose microcomputer and microprocessor systems, aiding the use of socialist import computers and computers of domestic manufacture.

As a result of the great spread of computer technology, research on the effect of computer technology on individuals and on society will increasingly come into the fore in the period ahead.

It is the goal of central supports and of the coordination of research and development plans that a modern division of labor should develop between computer technology research and development base institutes and the branch organizational institutes.

Realization of the goals will require an increase in the effectiveness of guidance also. Since we can speak of mass application as a result of the SZKFP it is absolutely necessary to take this into consideration in the practice of guidance also and this requires task oriented guidance. The most important goals are substantive guidance, coordination and making things work so guidance which has an informatics view is also a condition for a better organized and better coordinated execution of the program.

The directions which have been developed for the present medium range plan period and realization of the chief goals formulated in the program involve tasks and expectations which are great but which can be solved. Having undertaken this, we must carry out no less a task than to continue without a break the development of computer technology applications under conditions substantially more difficult and more complicated than before, to exploit and put into the service of development the intensive resources for development, to improve services, to preserve and where possible to develop further the level attained and to lay the foundations for later more dynamic progress.

8984

CSO: 2502/84

RESEARCH IN COMPUTER TECHNOLOGY, AUTOMATION

Budapest SZAMITASTECHNIKA in Hungarian No 5, May 81 p 3

[Article by Gusztav Hencsey, of the Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences (MTA SZTAKI): "Computer Technology and Automation Research at the MTA SZTAKI"]

[Text] A series of exhibits began on 20 March in the building of the OMKDK [National Technical Library and Documentation Center] on the basis of an agreement between the OMKDK and the Hungarian Academy of Sciences. To open the series the MTA SZTAKI exhibited the most significant research and development achievements of recent years. This event provides a good occasion to introduce the institute, which is one of the most significant bases of domestic computer technology research, having about 300 researchers. —The Editors

Five to Ten Years Ahead of Industry

The SZTAKI of today came into being 10 years ago with the amalgamation of the MTA Automation Research Institute and the MTA Computer Technology Center. Its predecessors could look back on a past of two decades and they had a pioneering role in starting and laying a foundation for domestic computer science and automation research. They gave the country experts who play a leading role in computer technology and automation research in various institutes and in guiding this research.

The researchers working in the institute are mathematicians and engineers and the purpose of their work is the utilization of the most recent achievements of computer technology in integrated industrial systems. The spread of these systems has begun already and in the last decades of the century their general use will become an ever more urgent necessity. The MTA SZTAKI, in which a very large intellectual and material capacity is concentrated by comparison with the circumstances of a small country, cannot deal exclusively with basic research. At the same time, as an Academy research institute, it has the task of staying 5-10 years ahead of Hungarian reality with its high level, forward looking research. Still, more and more threads tie its work to the realization of those modern systems and tools without which our technical progress, the modernization of industrial production

and the creation of a truly flexible technological and product structure could not be imagined.

The problems of the industrial introduction of research achievements are well known. It is an unending and difficult struggle. We have had our victories and our failures in this struggle. Without trying to be complete, let us introduce a few of the achievements of recent years.

The Hit of the Chicago World Exhibit

The institute has dealt with the automation of the machine industry virtually from the moment of its foundation. We have a decade of cooperation with the largest machine tool factories and industrial research institutes. In the course of developing integrated designing and manufacturing systems the new scientific achievements in the areas of machine tool control, computer assisted technical planning and production guidance have already given birth to systems operating in a factory environment and to products providing real export possibilities.

An integrated machine industry manufacturing system is being established in the Machine Tool Factory of the Csepel Works and in our experimental plant established jointly with the Budapest Technical University and the GTI [Machine Industry Technological Institute] and the development of new ones has begun (the Diagon-500 for the SZIMPI [Machine Tool Industry Works developmental institute] and a model system for the EVIG [United Electrical Machine Factory]). The ISTER tool designing system is used at United Incandescent. The DIALOG CNC microcomputer machine tool control system developed in the institute was one of the hits of the world exhibit in Chicago and as a successful product of the EMG [Factory for Electronic Measuring Instruments] it already plays a great role in increasing the export capability of the Hungarian machine tool industry. The researchers of our institute played a significant role in the development of the NC programming system of CEMA.

Network Development

Research and development in the area of computer networks is one of the youngest and most successful theme areas of the institute. Within this the most important task is the creation of a computer network for the Hungarian Academy of Sciences. The first terminal network has now been in operation for almost 10 years; it provides direct access for various research sites (including provincial ones) to the central CDC 3300 computer. The next step will be a system integrating the large computers of the Academy (CDC 3300, IBM 3031, ESZ 1035 and ESZ 1040) into a package linked network to which nearly 100 data stations can be connected. This will constitute the country's first large size modern network and it will serve as a model system for the development of others. By linking into the multi-center network of the IIASA (International Applied Systems Analysis Institute) we created the possibility for a true connection with international data circulation and in the near future terminals located in a number of places in the country will be able to link up with the international network through a TPA 70 computer. The development of a terminal family, of data transmission equipment and of appropriate software represents the TAF [remote data processing] background for network work.

The GC '80 in Series

We are playing a significant role in the development of open network architecture within the framework of ESZR-MSZR [Uniform Computer Technology System-Minicomputer Technology System] cooperation and in the development of network TAF systems.

In the area of technical devices and systems the most significant results are those achieved in the area of computer graphics, microcomputer process control systems and laser printing systems. The first large graphic display system of the socialist camp, the GD '71, was prepared 10 years ago. It was a real technical success; today it is the basis for many foreign and domestic computerized designing systems. It did not become an economic success because the domestic enterprises held aloof from series manufacture. The new multi-microprocessor graphic display family, the GD '80, is competitive even internationally and is a scientific and technical achievement. Series manufacture of the system has begun at the Signal Technology Cooperative and the demand is gigantic on both the domestic and foreign markets. Using these new graphic devices the institute is developing, among other things, a computerized designing office system and an air traffic control system.

A Laser Failure

The modular microprocessor process control system completed last year and handed over to TEXELEKTRO for manufacture is alone in its field domestically in regard to hardware and software. The systems already operating at the Tisza Thermoelectric Plant, Chinoín and the Czechoslovak TESLA firm will be followed by another 3-10 systems annually.

The laser line printer equipment, the development of which we began almost simultaneously with the large world firms, must be listed among the failures despite the fact that new patented solutions were born in the course of development and the sample models "met" the specifications. The chief cause of the failure is that to this very day there is no reliable xerographic equipment either here at home or on the CEMA market.

"Eye-Hand" Systems

Research connected with artificial intelligence and with object and form recognition began several years ago. A number of basic research achievements, internationally recognized and cited, have been born already--an algorithm serving to filter noisy pictures, a fast masked line algorithm working on a small computer, etc. The goal of the work is the creation of intelligent robots, of "eye-hand" systems, which can be used to automate various complicated assembly operations. In the development of a robot system we are conducting rewarding cooperation with the Leningrad computer technology center of the Scientific Academy of the Soviet Union.

An Operations Research School

The institute is one of the most important centers of applied mathematical research. Our operations research school has won international rank. Special mention must be made of the new models and methods developed in the area of stochastic programming

and of their applications. The models are used, among other things, to design water storage systems, flood water reservoirs and networks satisfying chance intersection requirements and are used to control the water level in the Balaton.

The significance of the results of research work being done in the area of information systems and data base management, work which is recognized even abroad, is proven by the fact that the demand for such systems is increasing very swiftly in virtually every area of the people's economy. Implementation of the ISDOS PSL/PSA system offers an outstanding tool for the design primarily of large enterprise information systems. The most recent research is grouped around a machine system serving SDLA (system descriptor and logical analyzer) system design goals and in the area of new type data models and natural language systems we have joined in the work of the most significant foreign schools.

The achievements listed (and from a certain viewpoint the failures also) contribute to our being able to undertake new tasks in the plan period now beginning, evaluating and re-evaluating our work thus far and regrouping resources appropriately, and in the areas which are most important for the people's economy we will invest that intellectual capital which the institute has accumulated in the course of years past.

Our plans and our achievements thus far are in harmony with the Council of Ministers report and resolution which summarise the tasks of the SZKTP [Central Development Program for Computer Technology] for the period 1981-1985 and are especially in harmony with those tasks which pertain to production guidance and technological processes.

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CSO: 2502/84

DMS 60, DMS 600 ON VIDEOTON COMPUTER DEVELOPED

Budapest SZAMITASTECHNIKA in Hungarian No 5, May 81 p 12

[Article by Laszlo Baffia of Videoton: "DMS 60 and DMS 600 on the Computers of Videoton"]

[Text] The two data base management systems again represent a significant development in the software supply for Videoton computers. In the first place they facilitate the creation of interactive multi-terminal systems. Whereas the creation of such systems with traditional programming methods (assembly, multi-task monitor) can be listed among the most complicated programming tasks, the task becomes performable even for programmers with average training with the use of DMS 60 and DMS 600, and both programming time and testing time are significantly reduced.

The DMS 60 system came up for domestic approval in 1980 and it can be sold in 1981. Testing of the DMS 600 is planned for the end of 1981 and sales are possible beginning in 1982. Despite this a number of user systems are in operation already as part of Videoton's own information systems and with several users also.

The DMS 60 data base management system was prepared for the Videoton ES 1010 and ES 1010 M computers and the DMS 600 system was prepared for the ES 1011. Both are upward compatible and make possible the management of a hierarchic net data structure approximating the CODASYL type, interactively and (in the case of DMS 600) from batched COBOL programs.

There is a set type connection between the records of data files related to one another in a father-son fashion. System abbreviation provides access according to key with a hash code method on the basis of full name or synonyms. It is also possible to carry out logical operations between groups of records designated on the bit map of the data files. The writing of special programs (transactions) providing interactive operation of terminals takes place in an easily learned language serving this purpose and this is a great help to data base management and terminal operation.

The basic principle in programming a terminal is that the operator uses the picture screen as blank paper, pencil and eraser. Considerable programming work does not have to be done by the programmer of the transaction in the interest of ensuring error correction possibilities. He only has to pay attention to adhering to certain rules. The system stores the data collected at the terminal in a special data file.

By pressing the proper function key he can return to earlier program parts and after correcting the faulty data he can return to the last picture screen state by pressing another function key. On the basis of the stored collections and by rerunning the appropriate part of the transaction the system can repeatedly produce the display picture.

When programming the transactions the programmer does not have to pay attention to the problems connected with the simultaneous operation of the terminals, the system takes care of this automatically. In addition to the customary data types (binary, decimal) the transaction language also handles special data types. The date (year, month, day, hour, minute) is a special data type. Text can be placed directly in the record also, but it is useful to store varying length texts in dictionaries serving this purpose. List type data are placed in a value table having a structure similar to access tables. It is useful to use this if a variable can take a value only from a definite value set. Reference type data serve to define the access key (abbreviation or full name) for the father record.

The instruction set contains the following instruction groups: terminal input, access to data base, screen editing, issuing messages and error signals, moving data between work fields, arithmetic comparison (equal, smaller, larger), logical comparison, conditional and unconditional branch instructions, activation of processors (the processors are system or user programs satisfying special requirements primarily written in assembly), and forbidding access to a designated record or lifting the prohibitions (in this way the system ensures that the various transactions running on several terminals will not access the same record simultaneously).

There is also available a query language, also easily learned, with which one can formulate commands selecting, listing or transferring to magnetic tape any part of the data base. The query command pertains to a definite data file and one can stipulate that:

- the desired records of the given data file have a relationship to records figuring in other data files of the data structure;
- the related record be the first, last or n-th member of the record chain;
- the record chain containing the related record contain more or fewer elements than a given number;
- the values of the various data fields of the related record fall between definite value limits.

The system displays the selected records on a bit map.

Then various operations can be performed with the designated records:

- listing in a standard format or in a format given by the formulator of the command with a write-out similar to the FORTRAN FORMAT instruction,
- grouping operations,

--ordering, or

--processing in a transaction.

In the DMS 600 system it is possible for COBOL programs being run batched outside of realtime operation to access the data base via a CODASYL type interface, processing or modifying the data stored therein. (In the DMS 60 system this is possible only on data saved on magnetic tape.)

The system ensures the security of the data base with the aid of a disk or magnetic tape journal system without the person setting up the concrete user system having to pay special attention to this problem.

The system makes possible so-called hot and cold reinitiation. In the case of hot reinitiation the state which existed prior to the interrupted transactions is restored on the basis of the record pictures prior to writing and the work can be continued from this point. In the case of cold reinitiation the content of the physically damaged disk is restored on the basis of an earlier disk salvage and the journal tape.

System security, or more correctly protection against inappropriate access, is also served by the fact that, in addition to checking personal identification codes, it can be prescribed when the system is set up with transactions can be run on which terminals.

A utility set supports the creation of the system, loading it with data and the salvage of data. Thus the user need not write a program for this purpose when setting up the system. Operation is facilitated by the fact that the operators can send messages to each other from the operator console and from the terminals. It is a characteristic of the system that when the data structure is changed (primarily by expansion) the earlier written transactions can be run without change, after salvage, regeneration and loading.

The following configurations are necessary for operation:

	DMS 60	DMS 600
operational store	32 k words	256 k words
disks	4x5 Mbytes or 4x10 Mbytes	5, 10, 50 Mbyte disks (maximum of 200 Mbytes)
central printer	one unit	
magnetic tape	minimum one unit	
card reader	optional	
display terminals (possibly with separate, programmable printer)	six or less	24 or less
terminal printers (linked to asynchronous line)	maximum 16 minus n	maximum 32 minus n
(n is the number of terminals in the system)		

Operation of the displays takes place on a duplex asynchronous line with a speed of 1,200-4,800 baud. DZM 180 mosaic printers can be connected to an asynchronous line (1,200 baud) as terminal printers. A DZM 180 fitted to a display as a printer can be programmed independent of the screen also. The central printer and the terminal printers can be operated with median disk storage also (via SPOOL).

The DMS 60 and DMS 600 systems can be used in many places. In industrial enterprises, for example, they are outstanding tools for solving with the most modern interactive methods the tasks of material and warehouse management, keeping records on orders, planning and scheduling manufacture, bookkeeping, keeping records on fixed assets or personnel, etc.

But they can also be used for similar purposes in large agricultural operations and, with suitable changes, in wholesale enterprises and department stores.

They may also be suitable for most special tasks in the various areas of state administration (record keeping, planning systems). It has already been used as a library information system also.

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FIRST ES 1035 OPERATIONAL STORE MADE OF INTEGRATED CIRCUITS DESCRIBED

Budapest SZANITASTECHNIKA in Hungarian No 5, May 81 p 6

[Article by László Illa, of the National Computer Technology Enterprises: "The ES 1035 Semiconductor Operational Store"]

[Text] The ES 1035 computer is one of the large capacity devices of the second series of the ESZR [Uniform Computer Technology System] computer family in our homeland. Due to developmental problems the computer was first delivered with a ferrite ring operational store. The first ES 1035 with an operational store made up of semiconductor integrated circuits arrived in our homeland this year. The test operation of this computer is now taking place in the computer room of the SZUV [Computer Technology and Management Organization Enterprise] Budapest Computer Center. In this article we would like to describe the semiconductor operational store bearing the model number ES 3238.

As far as we know this is the model number used for the semiconductor store of the ES 1035 central unit being manufactured in Bulgaria, on the basis of Soviet documentation, also.

The computers being delivered now arrive with an operational store of one Mbytes. The one Mbyte storage block is located in the power unit cabinet.

More Important Technical Data

Capacity, 128 K double words (1 Mbyte). Access time, minimum 530 ns. Length of reading cycle, minimum 800 ns. Length of writing cycle, minimum 1,200 ns. Element set, TTL logic elements, MOS store elements (dynamic RAM). Operations which can be executed, reading and reading-writing.

Before detailing the operation of the storage block we should become acquainted with the operation of the RAM integrated circuit which performs storage and with the storage cards made up of these.

The K 565 PY1 Dynamic RAM IC

Capacity, 4096x1 bits. Access time, minimum 350 ns. Length of reading cycle, minimum 630 ns. Length of writing cycle, minimum 1,000 ns. Restocking period time,

maximum 2 ms per cell. Capacity admission, about 400 mW in the active state and about 20 mW in the storage state. Power supply, plus 12V, plus 5V, minus 5V, plus-or-minus 5 percent. Technology, n-MOS.

(A structural diagram of the storage IC can be seen in figure 1.)

The 4,096 bits of information are organized in a 64 x 64 matrix. Of the 12 address bits required the 6 with lower place values address the line of the matrix and the upper 6 address the column. In addition to the address inputs the IC data include input and output (D and D-out), selecting input (CS), authorizing input (CE) and writing authorizing input (WE). Output for a value of CS equals one is high resistance (tristate).

The state and the dissipation of the IC can be controlled with the CE input. Capacity decreases significantly in the storage state so power supply can be scaled to the time in the active state. The integrated circuit has internal synchronization and control, which can be initiated with the CE equals one signal. One task of the internal control is the continual restocking of the stored information, whereby the data written in is stored in the form of loading in the condenser. Restocking always takes place by a full line, that is by 64 bits; thus in order to have guaranteed survival in store we must initiate a regeneration process from outside at a minimum of every 30 microseconds, taking care that all 64 lines have a turn during the 2 ms (64 times 30 microseconds equals 2 ms). The restocking process lasts about one microsecond and takes place once in every integrated circuit of the storage block. During this time the store sends an occupied signal to the central unit. Thus the block loses one microsecond of useful operational time every 30 microsecond due to regeneration. The IC operational modes of the store are: reading (readout of the addressed bit); writing (reading the addressed bit and writing over with new data); and regeneration (reading and rewriting 64 bits).

At the time of regeneration output is in an interrupt state. In the course of installation about one percent of the IC's had to be replaced due to faults. Of the equivalent types we might mention the INTEL 2107B, the TI TMS 4060-2 and the FAIRCHILD 4096.

The Storage Card

In the course of designing the card 16 storage IC's were put on one multi-layer printed circuit card, so the capacity of one card is 64 kbits. The storage IC's receive the signals necessary for their operation jointly on the card, where the control signals go to every circuit. The signals arriving to the card are buffered so the card inputs represent a unit load. The storage IC's are placed on the card in 8 lines according to the selector signals (2 IC's per line). At the time of selection the decoded signals from the 13-14-15 bits addressing the storage block select among the lines (CE inputs) while the 16 bit selects among the 2 IC's in one line (CS inputs). The selection of one RAM IC from the card takes place with the aid of these bits. The 12-1 bits of the address address one cell of the selected IC so that one bit can be accessed on one card. A strobe signal extracts the data read from the card. The CE input of the storage IC operates on plus 12 V, which has transistor signal formers. During regeneration bits 6-1 of the address

receive combinations between 00 and 3F from a counter in the control unit of the storage block. At this time the value of bits 12-7 can be optional.

Writing and Check Modes of the Storage Block

The block consists of 144 storage cards and 18 control cards. The double word information (8 bytes) is stored on 72 cards (one bit can be found on each card). The 8 bytes also contain 8 parity bits. These 72 cards can store 64 K double words of data and we call this one field. There are two fields in the storage block, with 8 bytes in both. Data exchange with store always takes place with 8 bytes of information (a double word); it is not possible to address a unit smaller than this. In order to address the 128 K double words of data stored requires 17 bits, with two parity bits. (The division of the address bits can be seen in figure 2.)

The block can operate in a complex or autonomous mode. In the complex mode one can carry out the data transfer prescribed in the program or functional and diagnostic tests. An autonomous check block is needed for autonomous operation; a place for this is built into the cabinet but it has not yet been delivered.

Component units:

--Timer block: creates control signals in time and initiates regeneration cycles.

--Control block: receives addresses, checks parity and generates CE signals for the storage IC. It can only read parity errors from the address.

--Buffer block: performs amplification of control signals. Each of the 8 buffer blocks sends control signals to two storage card blocks--belonging to the same field.

--Storage card block: contains 9 storage cards (one byte); there are a total of 16 blocks.

--Data I/O block: receives data to be written in and passes on data read after brief storage. Each of the 8 data I/O blocks is connected with two storage card blocks with the same line number.

The checking of the storage block can take place in the complex or the autonomous mode. The microdiagnostic test serving complex checking can be loaded from a cassette. The test consists of eight examples, of which the first four (the diagnostic group) can be run quickly and serve to filter out only gross errors. The four examples of the check group perform a fundamental check of every cell of the store and so take longer to run. Checking can take place in an automatic mode (the diagnostic group only) or in a dialog mode. In the event of an error the address of the erroneous data, the written and read data and the position of the faulty card are written out on the operator's console. If the error took place on a storage card it also gives the coordinates of the storage IC.

Automatic or manual operation checking can be done with the aid of the block used for autonomous checking. In automatic checking the test is run on the operator's console and a comparison is made between the data written in and the data read back.

Figure 1.

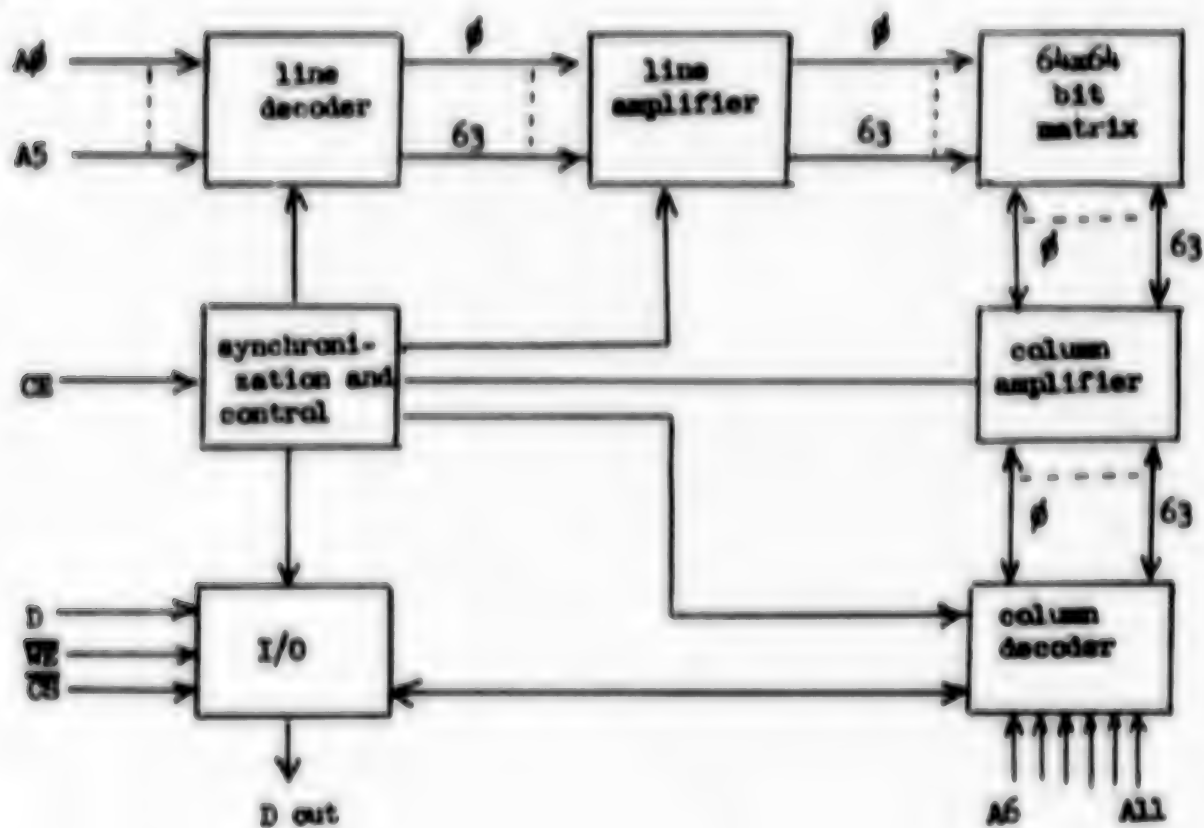
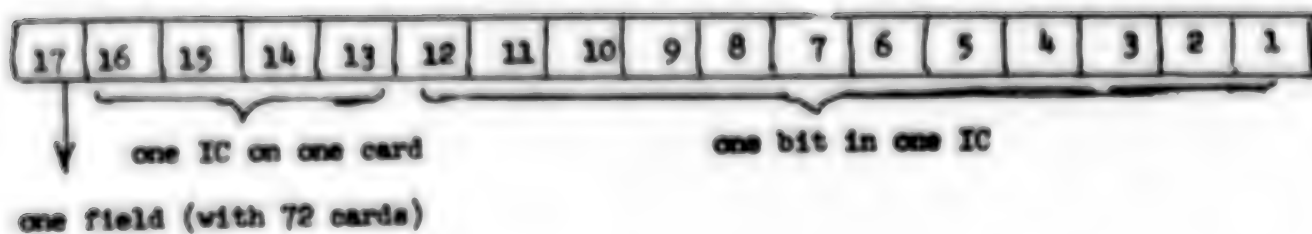


Figure 2.



In the event of an error the address and the line number of the faulty byte are given. The content of the faulty byte can also be displayed on the console of the check block. Checking can be done with seven tests, with multiple iteration or step by step.

To sum up let us see what advantages and disadvantages accompany use of the semiconductor store.

Advantages: Faster operational speed; a possibility for read only operations; smaller size and smaller power requirements; more easily repaired; and higher level diagnostics.

Disadvantages: It has a destructive character, loss of network voltage is accompanied by loss of information; because of its higher speed it is more sensitive to timing; and there can be "cross talk" between storage cells for manufacturing technology reasons.

The ES 3238 Operational Store

With the completion of factory developments now underway they will begin delivering operational stores with a capacity of 2 Mbytes. The store, consisting of two storage blocks, can be fit into the configuration as an independent cabinet. An adapter and signal commutator link the storage blocks to the central unit. It will thus be possible to expand the operational store of the ES 1035 to 3 Mbytes.

8984

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SUCCESSFUL EMBRYO TRANSPLANTS ACHIEVED IN CATTLE SECTOR

Bucharest REVISTA ECONOMICA in Romanian No 22, 29 May 81 pp 9-10

[Article by Agatha Popescu and Vasile Zahiu]

[Text] During Nicolae Ceausescu's working trip, on 21 April 1981, to research and production units of the Ilfov agricultural sector, workers at the Corbeanca Research Institute for Cattle Raising presented the main results obtained in improving the herds and producing the breeding stock. The focus was on a heifer evolved from crossing the Holstein and Sura de stepa [Steppe Gray] breeds, by nonsurgical, embryo transplant.

This article discusses the outstanding scientific and economic importance of this success of Romanian biological research.

The achievement of a revolution in the zootechnical sector, capable of increasing the input of this sector into the supply of raw materials to the food and light industries, the meeting of the scientifically substantiated consumption requirements of the population, and the creation of a surplus of animal products for export involves the unleashing of a genuine revolution in biological research, designed to directly help to rapidly and efficiently resolve the problems posed by production. A central objective must involve the constant effort to improve all animal breeds in order for us to equal the best zootechnical achievements on a world scale.

At the Second Congress of Agriculture the party secretary general pointed out: "Research must act far more rapidly to improve animal breeds for all species, proceeding from the native breeds, which, along the years, have acclimated to the conditions in our country.

The work to improve the animal breeds must focus on evolving breeds characterized by great biological value, increased corpulence, which would better assimilate the feed, provide high outputs in short periods with a fodder consumption that is lower per unit of product."

In the last decade the efforts of Romanian researchers in the areas of biology and genetics have produced some valuable theoretical-scientific and

practical-applied results, including the successful testing of the "embryo transplant," * whose chief objective involves obtaining a greater number of offsprings from very valuable genitors, by using the simplest possible procedures, less costly methods which ensure a broad and rapid overall use in current production practice.

The experts at the Corbeanca institute used the method in cattle, collecting embryos from a "mother" (donor) cow which was highly valuable in terms of productive potential, of the Holstein-Friesian breed. The embryos were transplanted to a "nurse" (receiver) cow of a lower economic value, of the native Steppe Gray breed, capable of ensuring the normal development of the fetus during the intrauterine period and give birth to a viable product.

This success is on a par with similar achievements of experts in various other socialist countries and in developed capitalist countries (United States, Canada, Denmark, Australia), enhancing the international prestige of Romanian scientific research.

Under the conditions in this country, the large-scale use of the embryo transplant in cattle raising units will have outstanding economic and technical-scientific effects.

Economic Benefits

The embryo transplant involves a highly efficient approach because:

a. It promotes the rapid numerical increase in the cattle herds (which, from about 6.5 million head early in 1980 must in 1985 stand at 7.2-7.5 million, and in 1990, at 10 million) because, instead of obtaining from a cow only one calf a year (excepting twin calving) or maximum 10-12 calves in a productive lifetime, by using the new method one can obtain from the same donor cow a number of fecundable ova which can yield 5 up to 20 calves a year, respectively 100-150 for the entire productive lifetime;

b. It can become a method for obtaining higher and higher outputs of milk and meat. By using embryos collected from "record-holding" cows (that yield from 30-40 liters of milk a day), inseminated with seminal stock from bulls that had been tested in terms of milk yield improvement (at the top of the "improvement pyramid") it is possible to obtain future generations of plusvariant cows, which would raise the average milk output, in many agricultural units, to at least 3500-4000 liters/cow/year. Moreover, considering that one cow could yield 100 calves in a productive lifetime, this means a plus of 20 tons of meat, an amount which would double if an extra embryo would be transplanted in the uterus of cows from the breed for meat, while in the incipient gestation stage, and thus obtain two calves (instead of one) for fattening and marketing.

* The method was developed about a century ago (Heape, 1890) at that time using laboratory animals. It was continuously improved and today, on a world scale, it has become a technical method of major genetic and economic importance.

- c. It makes it possible -- until the process of conversion by "absorption" with the Friza and Bruna breeds is completed -- to better use the local unimproved cattle breeds: Sura de Stepa, Rosia Dobrogeana and Mocanita, that can constitute a biological stock capable of receiving the embryos, develop them and produce the offsprings, under profitable conditions of upkeep and utilization (because these breeds are less demanding in terms of feed);
- d. It creates conditions for minimizing the costs for trade in live animals (cost of transportation, buying price for the animals, and so on), with this trade being done only in economically well justified cases; to the extent that prospects will be created for serial production of embryos, that would be preserved, stored and distributed to zootechnical production units, great savings of financial means and time will be achieved;
- e. Versus trade with live animals (especially when these are transported over long distances), we also avoid the risk of contracting diseases, the stress caused by transportation and adaptation to new living conditions, with all their adverse economic ramifications -- expenses with drug treatment, production loss during the period of stress and adaptation, and so forth;
- f. The method involves relatively lower costs in terms of labor, biological material, equipment, hormonal substances and other materials used and there is the prospect of appreciably reducing the cost per transplant as the procedures for the various stages are upgraded;
- g. The marketing of the extra milk and meat productions, the selling of live animals as breeding stock derived from valuable genitors will result in big incomes, greater and greater profits, helping to boost the profitability of the cattle raising units;
- h. The accumulation of experience in production practice and in upgrading the methods for producing and storing embryos over a long period will open up a new field for expanding Romania's economic cooperation relations with other countries, through the export of the surplus of valuable embryos -- which would provide a significant foreign currency intake for a product obtained with minimal consumption of materials and energy. In a not too distant future, Romania could become a "center" that would supply embryos with guaranteed pedigrees, together with all the know-how services, to assist farmers in developing countries.

Scientific Importance

Furthermore, the embryo transplant also has a theoretical and scientific value:

- a. In the area of cattle improvement: it will be possible to achieve a more rapid progress, induced by mothers. At this point, the greatest input (70%) in inducing the genetic progress is provided by bulls, while the cow's input is only 30%. By using selected "mother" cows as plusvariant donors, based

on controlled sexing and raising of embryos, one may obtain generations of valuable females;

b. In the context of producing sets of calves (5-20) per year and per donor cow, during the period when she normally is pregnant, the embryo transplant permits the acceleration of the cattle improvement process and reduction under 4 years of the interval between generations;

c. The rise in the number of offsprings per mother cow and per father bull, involved in efficiency testing for the production of milk, meat or both, creates conditions for increasing accuracy to determine the bull's improvement value.

d. In the area of genetics:

The embryo transplant permits the genetic study of embryos, spotting of those which involve nuclei that carry anomalies, that generate hereditary diseases, the embryos with abnormal morphological modifications. The use of laser, of Roentgen rays, of genetic microsurgery on "deficient" genes makes it possible to destroy them and replace them with valuable genes. This provides the certitude for obtaining healthy, viable animals, characterized by a high hereditary potential.

e. In the area of cattle reproduction:

The embryo transplant permits the study of the estrous cycle in the cow and, by and large, the study of the morphological aspects of reproduction in this species; it contributes to upgrading in vivo and in vitro fecundation procedures for cow ova; it promotes the upgrading of the procedures for preserving cow zygotes by freezing, for the purpose of storage and future utilization; it permits the controlled obtaining of generations of males or females, in accordance with the needs in terms of milk or meat output, by preliminary embryo sexing prior to the transplant.

f. From the biological standpoint:

In the case of embryo transplant experts did not find any phenomenon of "rejection" such as those occurring in organ transplants;

The calves born from transplanted embryos retain their individuality (they are not affected by the maternal influence of the "nurse" cow), have a very good viability, immunity to diseases due to the antibodies provided through the colostrum of the receiving cow and adapt easily to the environment;

The embryo transplant may be an area for expanding international scientific cooperative relations, for the purpose of enhancing the input of science into resolving some acute problems of our times, such as the "hunger for protein."

Disadvantages, Limitations

In spite of these certain advantages, the embryo transplant also involves some limitations and negative aspects, especially entailed by the still incipient stage of approaches.

During the stages of the transplant, loss of biological material occurs.* Moreover, adverse effects are still making themselves felt in terms of some shortcomings in the methods for morphological assessment of embryos, long-term storage, in collection and transplanting techniques, and those resulting from the sometimes inadequate quality of hormonal products and the instruments used. We assess that these limitations can be done away with as a result of the efforts of research and by ensuring some conditions needed by this sector.

Necessary Organizational, Technical Measures

The wide-scale use of the embryo transplant in production requires the ensuring of the appropriate technical-organizational framework, principally by:

- a. Creation of a center for production, storage and massive distribution of bull embryos, a center provided with scientific-applied research laboratories in the areas of genetics, improvement and reproduction (equipped correspondingly), sections for controlled production of embryos designed to replace the current breeding stock, a trade service in charge of storage and distribution of embryos to the user units;
- b. Creation of a network for distribution of stored embryos to all Romanian counties (upon the pattern of the reproduction and selection network), in accordance with the 1985-1990 long-range improvement program;
- c. Itemization, from the existing improvement program, of the proportion of the cattle herds (for the various breeds) destined for reproduction by embryo transplant, with lists of donor cows, of tested improver bulls, matching of pairs for achieving products with valuable pedigrees; individualization of products obtained by transplant and follow-up of their efficiency in production;
- d. Officialization, by regulatory acts, of the use of embryo transplants in production, specifically in the units with a reduced biological stock;
- e. Training of specialists in the field of reproduction to achieve embryo transplants in production units.

* 25-30% of selected donor cows cannot be utilized in zygote collection due to nonspecific reactions in hormonal treatment. The fecundity percentage is somewhat lower in cows with superovulation: 65-95%. The number of viable zygotes collected surgically ranges between 80 and 90%, and non-surgically, 45-60%, and this is due to the shortcomings that still exist in these techniques. The pregnancy percentage is 50-60% in the case of the surgical transplant and 40-50% in the nonsurgical procedure. The stage of collection of embryos, especially blastocyst, in the uterus, results in obtaining a lower percentage of embryos for transplant and nidation.

ROMANIA

BRIEFS

NUCLEAR PHYSICS CONFERENCE--Bucharest, 12 Jun (AGERPRES)--On June 12, the proceedings of the international conference on "Nuclear and Atomic Physics With Heavy Ions" concluded in Bucharest. The conference was carried out under the aegis of the European Society of Physics and of the specialized bodies in Romania. For 4 days, almost 150 specialists in the domain of nuclear and atomic physics, from Romania and many other European countries, as well as from the United States of America and Japan, approached current questions of researches particularly related to the study of heavy ions, a field of special importance for the peaceful applications of nuclear and atomic physics.
[Bucharest AGERPRES in English 1830 GMT 12 Jun 81 AU]

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